Nearshore Ecological Data Atlas (NEDA) Science Workshop

September 20-21, 2011
Comfort Suites, Corvallis, Oregon

Overview

This is a summary from ODFW's Nearshore Ecological Data Atlas (NEDA) Science Workshop. The workshop brought together scientific experts, from various academic fields and management agencies, to review and comment on existing spatial data and analyses. In addition, the group was introduced to MARXAN, a decision-support tool for conservation planning, and discussed using the program in the context of ODFW's task of identifying ecologically and biologically areas of significance or "hotspots". This document summarizes the major themes, decisions, and questions that surfaced during the workshop.

The primary outcomes from the workshop include:

- Received feedback on proper use of existing datasets
- Identified new data sets
- Received guidance and input on Marxan Analyses
- A scientific review team was assembled
- Workshop materials and presentations have been posted online: http://www.oregonocean.info/

Context

Oregon is currently engaged in a marine spatial planning process that will lead to the identification of areas within the territorial sea suitable for ocean energy development. During this process ODFW is responsible for providing pertinent ecological information and identifying the most important ecological areas, relative to goal 19, which should be protected from future development. ODFW's information will feed into the current statewide marine spatial planning process. NEDA will be an important resource used in current and future statewide planning and management efforts. For lack of better terminology, our current project is to complete NEDA Phase I for TSP Part 5 completion, which is expected to be finalized in summer 2012. However, we (ODFW) intend to continue work on NEDA and have future phases during which wish list items are obtained and data sets are updated.

NEDA is a collection of ecological data sets (biological, oceanographic, habitat) that are displayed and analyzed in a spatially explicit way. Many of the NEDA datasets will be displayed on Oregon Marine Map. As a planning resource, NEDA will serve the following purposes:

1. Identify existing information relevant for Goal 19 and CMSP
2. Make existing information accessible to public and managers in a spatially explicit format
3. Prioritize areas in territorial sea that are important for ecological resources (based on current best available science)

Ecosystem

1. *Data Use & Limitations* (in hand data)
    a. **Dissolved Oxygen (DO)**
        i. Use this dataset so that you represent diversity within chemical realm of ocean (different representation of habitats); we want to select some percentage of low DO sites to provide representation; low DO is not good or bad and use of the data should reflect this; in Marxan, want to represent all DO "habitats" without preference to capture diversity of habitat – VanderSchaaf
        ii. Range Categories: [0-.5 mL/L; 0.5-1.4; 1.4-2.5; 2.5+] – Francis Chan
    b. **Chlorophyll A**
        i. Range: [0-.5 mg/m3; 0.5-2, 2-10, 10-20, 20-50] **-** Francis Chan
    c. **Upwelling**
        i. Include data from J. Barth (ocean fronts, retention,)
        ii. May want to Split into low and high persistence – VanderSchaaf recommendation via Barbara Hickey (UW)
        iii. Arguably too broad for ecological purposes
        iv. upwelling persistence is already categorized (will go with that but want future review)

2. *Other Existing Data Sets* (includes information that is new to ODFW, or new analysis of existing data that will take longer than NEDA Phase I, or data sets that are in progress right now)
    a. Climate Change Vulnerability/Resiliency:
        i. Oregon Climate Assessment Report occri.net/ocar to download report, excellent summary of abiotic environmental changes that have already been documented & ecological assessment of changes
    b. J. Barth had a student who took *chlorophyll dat*a and *NOAA fish catch* and did association analysis on habitat and hotspots; can that derived product be put in? Michael Schindel response: that is similar to what we've done already, but more robustly (share to see if it looks like Jack's student's work)
    c. Columbia River Plume – J. Barth may have some data
    d. Sand dollar beds – data exists (new seafloor mapping), but haven't been interpreted yet

3. *Data Needed* (data gaps for which there are no existing data, no known work in progress)
    a. Invertebrate data – presence/absence
    b. Retention zones
    c. Migration zones

4. *Marxan Analysis*
    a. Identify unique habitats and diversity of habitats: want to use all physical variables in Marxan, not just as basis for modeling other things;
    b. Use categorical representation instead of continuous data, to remove judgment of which end of the continuous scale is "good" or "bad";
    c. use a step-wise approach to determine categories and verify they're appropriate,

d. Have combined feature that would include topographic position, bathy and substrate (relevant for outside TS);
e. Add true shelf break data (not synonymous with isobath) western extent,
f. Restrict analysis and data to nearshore area and don't get distracted by hits in Federal waters;
g. How far will the Marxan go beyond TS (natural cutoff)?
    i. Michael - cutoff where data set gets inconsistent
    ii. Francis - shouldn't you only analyze the domain in which you are making a decision
    iii. Caren - don't want to limit data or analysis to TS; can have mathematical buffer
    iv. Michael - want to run both simultaneously
h. Cape Arago is the appropriate line to divide north and south
i. Treat estuaries uniformly – but have them "locked in"…use estuary mouth as a proxy for importance

5. *Other Recommendations*
    a. Identify unique habitats, diverse representation

Fish

1. *Data Use & Limitations* (in hand data)
    a. NOAA fish model output – The following layers are appropriate for use in marine map and marxan:
        - total fish species richness
        - total fish abundance based on count
        - total fish abundance based on weight
        - nearshore species group abundance based on weight
    b. HSP Juvenile fish data – These data are too generalized to be useful at the scale of the Territorial Sea planning effort. Current data are not adequate for making conclusions about juvenile fish abundance and distribution. It would be appropriate to develop a strategy for collecting and analyzing data for juvenile fish in the futurre, but for now, it is a data gap
    c. The surveys don't capture certain species; especially the smaller ones. This is a data limitation that should be mentioned.

2. *Other Existing Data Sets* (includes information that is new to ODFW, or new analysis of existing data that will take longer than this phase, or data sets that are in progress right now)
    a. NOAA**:**
        i. Observer data are available. NOAA gives it out all of the time. Nearshore data are available, richer in the nearshore. Summarized enough so that you cannot identify individual fishing operations. Data included Retained and discarded catch. 20-25% of fleet is covered. Catch share (Jan 2011) is 100%. These are coast wide data. – Burke
    b. HSP juvenile fish expert knowledge/trawl survey data:

i. Biogenic data sets being developed. Fishery independent data are available now. Density plots can be developed. Trawl surveys have many caveats with respect to invertebrate catch. – Curt Whitmire

c. Pelagic and forage fish:
   i. Rick Brodeur and Bob Emmett - BPA studies. surface trawls. Southwest juvenile rockfish surveys- Steve Brawlstein go as far north as Newport. Pre-settlement, post larval survey. – Heppell
   ii. Project CROOS. Gil Silvia. Includes genetic samples and weights. Might be useful in a couple of years with more data – Mike Thompson
   iii. 3D modeling of water quality and habitat. Application to fish suitability. Atlantis model- 3D hydrodynamic model might be able to be applied (Seattle NWFSC Isaac Kaplan). – S. Brandt
   iv. Steve Rumrill- There are some pelagic data out of coos bay, and possible on the north coast.
   v. fishery acoustics. Hake survey - Rick Brodeur.
   vi. Kelly Benoit bird uses acoustics
   vii. historic data, Doug Markel surveys. 1960s and 1970s.

d. OSU field course, tidepool: species list and abundances. Marine bio group. These are point samples on the central coast. The intertidal fish community is not represented in the current data. OIMB may have a similar data set

e. IPHC data

f. Aerial surveys, council EFP

g. Old biogenics modeling around EFH

h. Siletz reef fish surveys

i. Tom Calvanese's work in Port Orford

j. NMFS critical habitat data.

k. POST data (canadian) accoustic arrays

3. *Data Needed* (data gaps for which there are no existing data, no known work in progress)
   a. Nearshore forage fishes. Herring, smelt- these species might be important in development siting
   b. (Pelagic and forage fish) Adult spawning habitat. Can be out over sand where predation risk is lower, spawn over sand. – Heppell
   c. Green sturgeon migration corridor
   d. Almost totally lacking *small demersal fish in NS area*, so need to think about the tool you are using in light of that missing info. Almost need caveats to using the system – Bob Hannah
   e. HSP juvenile fish data
   f. Species to choose to represent our nearshore soft bottom: may want to consider looking at forage fish systematic gut sampling to get at that information
   g. Other modeling exercises- ratio between count and weight (indication of nursery area)

4. *Marxan Analysis*
   a. Keep all targets except nearshore abundance based on count and diversity

5. *Other Recommendations:*
    - **a.** Species to Choose to Represent our Nearshore Soft Bottom
        - i. See "Ecology of Marine Fishes: California and Adjacent Waters for general nearshore fish assemblages
        - ii. lingcod- inshore/offshore component. Trawl and nearshore fishery pick up different component
        - iii. pacific sand dab- indicate ecologically important areas
    - **b.** observer data. Catch of rocky reef species in non rocky reefs.
    - **c.** If try to obtain invertebrate data NOAA trawl surveys, keep caveats in mind
    - **d.** Keep spp richness abundance on count and weight as targets
    - **e.** Strong support for including estuary ecological functions in Marxan; use of estuaries as nursery area, and migration
    - **f.** Observer data could probably be used for this process to potentially fill in gaps

Bird

1. *Data Use & Limitations* (in hand data)
    - **a.** All good datasets, each add their own value and can complement and cross-validate each other.
    - **b.** There are spatial and temporal differences in data collection methods.
    - **c.** Generally the best distribution and abundance data to use in the Territorial Sea is the CCR observation data, while the offshore models provided by PRBO would be best for offshore waters.
    - **d.** USFWS Seabird colony data was confirmed as an important source for understanding the distribution and abundance of breeding seabirdsas well as delineating the location of terrestrial habitat critical to their life history.
    - **e.** The USFWS Seabird colony "importance" rating is good, but need classification criteria to be clearly recorded in the metadata.
    - **f.** PRBO data – included the different functional species groups together in summary layers. Would be good to be able to split them out.
    - **g.** CCR data - data caveats - we only counted birds on the water, not birds in flight (except for aerial foragers such as pelicans and terns. Sooty Shearwater is under-represented in the CCR data due to the fact that only birds observed sitting on the water were counted in the observations, this should be written in the metadata. Craig will make sure Mike follows up on that task.

2. *Other Existing Data Sets* (includes information that is new to ODFW, or new analysis of existing data that will take longer than this phase, or data sets that are in progress right now)
    - *a.* PRBO – could re-run modeling for just Oregon

3. *Data Needed* (data gaps for which there are no existing data, no known work in progress)
    - **a.** Loon Migration data – would serve as an example of a bird species that uses consistent migratory paths. Might be able to entice the Yaquina Bay Birders to provide counts and information on this.

b. It was recognized that winter species composition would be different from other seasons, and that there are no existing data sets that would help fill that gap.

4. *Marxan Analysis*
    a. Generally the group was supportive of the suite of information being used in the analysis, and was comfortable with the metrics that had been developed and used for species diversity and density.
    b. There were some species that could be representative of functional groups (Loons and Grebes as nearshore functional group), and some that could be considered as proxies for forage fish abundance (e.g., Brandt's Cormorants and Common Murres in the CCR dataset may represent foraging fish distributions that occur within foraging range of breedung colonies, and Sooty Shearwaters in the PRBO dataset, which aren't tied to breeding colonies).
    c. USFWS Colony data - ensure historical colony information is used for determining species presence/absence/maximum abundance at a colony. For some species in particular, this was important (eg. Tufted Puffins), because the habitat is still present but the population has declined over time (and could theoretically rebound in the future). It was suggested that each of the 3 relative "importance" levels could be a separate target in Marxan.

5. *Other Recommendations*
    a. Could possibly combine Common Murres and Brandt's Cormorants data from CCR and PRBO, and Sooty Shearwater from PRBO to use as a proxy for important forage fish areas. PRBO will explore this possibility quantitatively.
    b. Loons and Grebes can represent a nearshore functional group of seabirds (CCR data).
    c. CCR data should not be extrapolated offshore, but PRBO data could be fairly extrapolated inshore
    d. Obtain and use PRBO's single species models (sooty shearwater, black footed albatross, common murre and Brandt's cormorants) as Marxan inputs

Marine Mammal

A separate meeting for marine mammal experts was held on October 5, 2011 due to low attendance during the NEDA Science Workshop. Twelve individuals were in attendance – six of which were marine mammal experts. These individuals assisted by reviewing existing datasets, discussing limitations of data, and identifying new or additional information to consider. Topics covered during the meeting include gray whale migration corridors, gray whale and harbor porpoise encounter data, cetacean modeling, and pinniped distribution data.

1. *Data Use & Limitations* (in hand data)
    a. Gray Whale Migration Corridors
        i. Use the Ortega-Ortiz and Mate (2008) study to represent gray whale migration corridors; define boundaries of the corridors by the depths at the 10% and 90% observation levels (data not directly report in the publication, but previously provided by OSU Marine Mammal Institute).

ii. Examine the depth distribution of the migration data reported in Perryman, et al. (1999) to see how closely that matches the Ortega-Ortiz and Mate (2008) data.
iii. Present the corridor data as a single corridor that encompasses the three phases of migration.

b. Resident gray whale and harbor porpoise data from Craig Strong surveys

i. Use the Craig Strong data to depict resident gray whale and harbor porpoise relative abundance.
ii. Use both average encounter rates and the average of the 3 records in each sampling unit with the highest density of encounter rates (to depict hot spots that don't consistently appear from year to year). (Note that Calambokidis is not entirely comfortable with this approach without seeing the data first.)
iii. Depict survey areas with no sightings (zeros in the data) as still potentially having individuals.
iv. Examine possibility of using additional harbor porpoise data to extend information offshore of the Craig Strong data.

c. Cetacean Modeling

i. Use the N/S component of species predicted densities as a representation of relative density, not absolute density, inside of 100m water depth.
ii. Karin **Forney** will review the maps for individual species and follow up with an email to the group confirming some of the conclusions.

d. Pinnipeds – info regarding depicting foraging area, "They are generally opportunistic and wide-ranging foragers. Breeding Steller sea lions will generally forage within 20km of the rookeries, but will range farther once reproductive season is over."

2. *Other Existing Data Sets* (includes information that is new to ODFW, or new analysis of existing data that will take longer than this phase, or data sets that are in progress right now)
   a. Gray Whale Telemetry Observation Analysis (Bruce Mate). Further work up of the data would provide clarification/cross validation (with CCR data) of summer resident hot spots and provide a sense of behavior between hot spots. These data exist (10-11 months of data for some individuals; how many were tagged?) but would take modest amount of funds to work up

3. *Data Needed* (data gaps for which there are no existing data, no known work in progress)
   a. Many Data Gaps exist… especially winter distributions of marine mammals
4. *Marxan Analysis*
   a. Cetacean Modeling: Use high, medium, low relative abundance designations, if the data are used as Marxan targets. The thresholds for these 3 categories needs to be decided
5. *Other Recommendations*
   a. Karin, John, and Bruce tentatively agreed to be on the "SWAT team", pending time availability, to provide quick feedback about data and subsequent analyses

Other Advice and Information

1. *temporal dynamics*
    - Think about where hotspots continually occur over time? Find areas where variance is low.
    - Seasonality (generally lacking data from late fall/winter to early spring)
2. *understanding sampling differences*
3. *buffers around islands/rocks*.
    - Buffers will be more important/come into play at the siting stage, but important to consider in planning phase.
    - Fish forage buffer different than technology impact buffer
4. *Develop definition or layout the criteria for identifying "ecological hotspots"*
    - E.g. "an ecological hotspot is: a place that has species, processes, and/or habitats of concern that need to be protected from disturbance such as a wave energy development. And that is stipulated by Goal 19."
    - concerns - confidence in data layers that go into hotspots. We can tell you pretty clearly about habitat and oceanographic hotspots, but ecological is more challenging. Could we add guardrails onto the data - to get a 1st order. Can ODFW reel back the expectations and say this is what we have, with caveats, and this is what still needs to be done. →Caveats will be included for people to see/read
        - **be clear on the limitations of the data and implications when presenting it
    - concern - hot spots- critical life stages as well as most abundant. Is ODFW properly identifying these areas?
5. *May want to consider creating a map or two of where data are present and where absent. Derived, present, absent. Areas of needed concentration*

Workshop Participants

ODFW and the MRP would like to acknowledge and thank the following individuals for participating in the NEDA Science Workshop and the Marine Mammals Workshop, and for offering their time and focus during these events (presented alphabetically by last name). Those who were invited but unable to participate are indicated with an asterisk.

Last, First – Affiliation (Expertise)

Barlow, Jay - NOAA (Mammals)
Barth, Jack - OSU (Ecosystem)
*Batchelder, Hal - OSU (Ecosystem)
*Becker, Elizabeth - NOAA (Mammals)
Borberg, Jenna - Sea Grant (Staff)
Braby, Caren - ODFW (Staff)
Brandt, Stephen - OSU (Fish)
*Brodeur, Rick - NOAA (Fish)
*Brown, Robin - ODFW (Mammals)
Burke, Patty - NOAA (Fish)
Calambokidis, John - Cascadia (Mammals)
*Caldow, Chris - NOAA (Fish)
*Carr, Mark - UCSC (Fish)
Chan, Francis - OSU (Ecosystem)
Donnellan, Mike - ODFW (Staff)

*Emmett, Bob - NOAA (Fish)
*Erickson, Dan - ODFW (Fish)
*Essington, Tim - UW (Ecosystem)
Forney, Karin - NOAA (Mammals)
Fox, Dave - ODFW (Staff)
Galleher, Stacy - ODFW (Ecosystem)
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*Heppell, Selena - OSU (Fish)
Hixon, Mark - OSU (Fish)
Hodder, Jan - OIMB (Seabirds)
Jahncke, Jaime - PRBO (Seabirds)
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Laferriere, Alix - ODFW (Ecosystem)
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Lowe, Roy - USFWS (Seabirds)
*Manson, Paul - Parametrix (Analytical)
*Markle, Doug - OSU (Fish)
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*Peterson, Bill - NOAA (Ecosystem)
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*Starr, Rick - CA Sea Grant (Fish)
*Steinback, Charles - Ecotrust (Analytical)
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Suryan, Rob - OSU (Seabirds)
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Tissot, Brian - WSU (Ecosystem)
*Tolimieri, Nick - NOAA (Fish)
Vance-Borland, Ken - consultant (Analytical)
VanderSchaaf, Dick - TNC (Ecosystem)
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Whitmire, Curt - NOAA (Fish)
*Zamon, Jen - NOAA (Seabirds)